 CARLO GAVAZZI SPACE SpA		AMS02-TCS		1 Doc.N° : NCR-TCS-CGS-C-001 NCR ref Rev.: 1 Date: 17.10.2008 Page 1 of 2 attach: 5	
		NON CONFORMANCE REPORT			
2 NCR Title: HEATERS DE-BONDING					
3 Supplier AIDC		4 Purchase Order N° I/008/08/0		5 Model FM	
8 NC ITEM Identification WAKE RADIATOR heaters		9 Drawing N° 22-AMS.000.00.63 Rev. A		10 P.N. / C.I. N° See the Non Conformance Description	
12 Next Higher Unit Id. WAKE RADIATOR ASSY (AFE for CGS)		13 Drawing N° 22-AMS.000.00.00 Rev. C		14 P.N. / C.I. N° 22-AMS-000.00.00	
				11 Serial N° N.A.	
				15 Serial N° 01	
16 NON CONFORMANCE Detected During:					
RECEIVING INSP. <input type="checkbox"/> MANUFACT. <input type="checkbox"/> ASSEMBLY/INTEGRATION <input type="checkbox"/> FINAL INSPECTION <input type="checkbox"/> TEST <input type="checkbox"/> Receiving Inspection <input checked="" type="checkbox"/>					
17 Initiator, Dept., Date, Signature C. Vettore 17.10.2008					
18 Description of NON CONFORMANCE					
Some of the heaters mounted on the WAKE Radiator (22-AMS-000.00.00 Rev. B) present unusual de-bonding areas. The de-bonding aspects are of different types, namely single bubbles, diagonal wrinkles and half-moon shape peeling-off near the lead exits. The heaters affected by these de-bonding are described in the annex of this NCR					
19 Requirements violated					
20 INTERNAL NRB Dispositions:					
To discuss the points in a dedicate NRB to evaluate the possible impacts (if any)					
21 Verifications OK See Annex 2 16.01.2009					
22 Suspected cause of NC:					
OPERATOR/PROCEDURE ERROR <input type="checkbox"/> HANDLING <input type="checkbox"/> TRANSPORTATION <input type="checkbox"/> TEST EQUIPMENT <input type="checkbox"/> TOOLS <input type="checkbox"/> SW <input type="checkbox"/> DESIGN <input type="checkbox"/> PART <input type="checkbox"/> MATERIAL <input type="checkbox"/> PROCESS <input type="checkbox"/> TEST <input type="checkbox"/> OTHER..... <input type="checkbox"/>					
23 Classification					
MINOR <input type="checkbox"/> MAJOR <input checked="" type="checkbox"/>					
24 Corrective/Preventive Actions:					
25 REQUEST FOR WAIVER					
YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N°					
26 Analysis Required					
YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N°					
27 Other related documents:					
28 P.A.					
29 Syst. Engineering					
30 P. M.					
31 C.C.					
Department: L. Cremonesi Name: C. Vettore Signature: <i>[Signature]</i> Date: 25.10.2008					
Department: M. OLIVIER Name: M. OLIVIER Signature: <i>[Signature]</i> Date: 25/10/08					
Department: C. Cinquepalmi Name: C. Cinquepalmi Signature: <i>[Signature]</i> Date: 25.10.2008					
32 CUSTOMER/HIGHER LEVEL CONTRACTOR NRB Dispositions (Class Major Only):					
33 Finally determined Cause of NC					
34 Corrective/Preventive Actions:					
35 Customer/HLContractor Approval:					
36 CLOSE OUT CERTIFICATION					
CGS PA/QA					
PA/QA Stamp					



CARLO GAVAZZI SPACE SpA

0

AMS02-TCS**NON CONFORMANCE REPORT**

1

Doc.N° : NCR-TCS-CGS-C-001

N

C

R

ref

Rev.: 1

Date: 17.10.2008

Page 2 of 2 attach:

37

CONTINUATION SHEET

<input type="checkbox"/> SUSPECTED CAUSE OF NC	<input type="checkbox"/> INTERNAL NRB DISPOSITION	<input type="checkbox"/> DESCRIPTION OF NC
<input type="checkbox"/> FINALLY DETECTED CAUSE	<input type="checkbox"/> CUSTOMER NRB DISPOSITION	<input type="checkbox"/> CORRECT/PREVENT. ACTIONS
<input type="checkbox"/> REQUIREMENTS VIOLATED		

Verifications

On 27.04.2009 the AMS Collaboration deliver to CGS the two main radiators (RAM and WAKE) for the execution of the recovery actions of this NCR (see annex 3).

The chofoil application guidelines have been reported in the annexed Minute of meeting (AMSTCS-MI-CGS-034 , annex 4 to this NCR) and here summarized .
Owing to the air bubble risk the step 2 has been modified according to the documentation shown in annex 5:

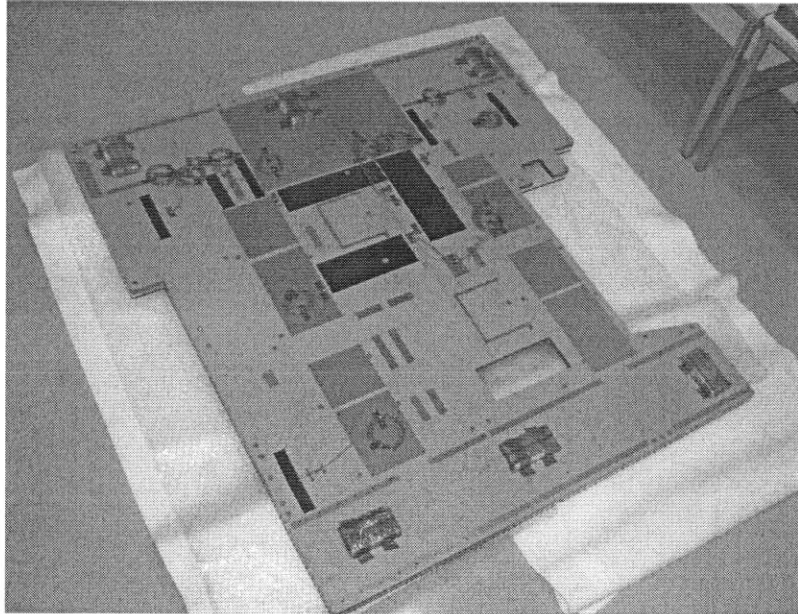
- 1- Check bubble size and if the diameter is less 15mm proceed with the chofoil application
- 2- Around the glue drops of the heater patch perform the activity shown in Annex 5
- 3- Clean the heater surface with IPA
- 4- Cut stripes of chofoil tape (CCJ-36-201-0100) and apply the stripes over the heater extending the tape out off the heater edge nearly 10mm.
- 5- Make the tape stripes overlapping each other by 5mm
- 6- Let the tape perfectly adhere the heater/overlapped tape with a pressure of a teflon tool
- 7- Adjust the chofoil all around the lead exit avoiding to cover the cables
- 8- Secure the chofoil tape all around the heater with drops of glue (EC2216 B/A Gray)
- 9- Take pictures of the reworked activities

1) - 2) - 3) - 4) -
5) - 6) - 7)
08/06/09
8) 24/06/09

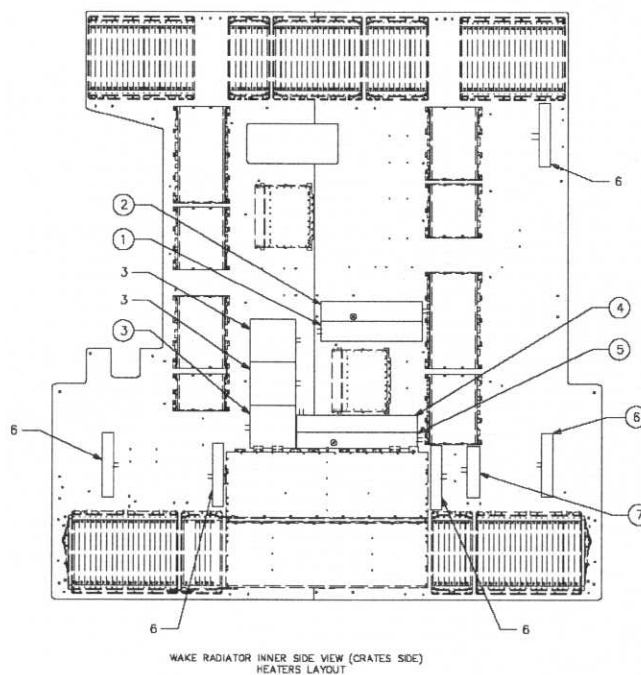
9) see
Annex 6

WAKE RADIATOR Heaters

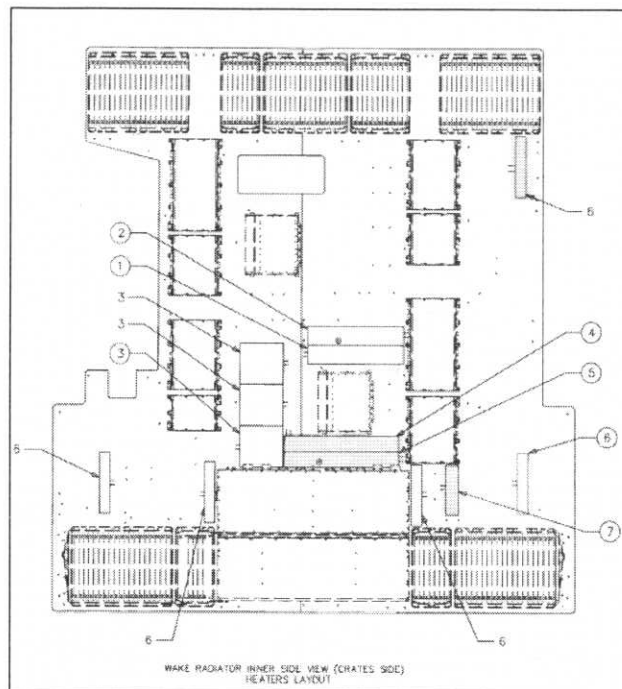
The following picture shows the WAKE radiator heater lay-out according to Wake heater installation drawing 22-AMS.000.00.63



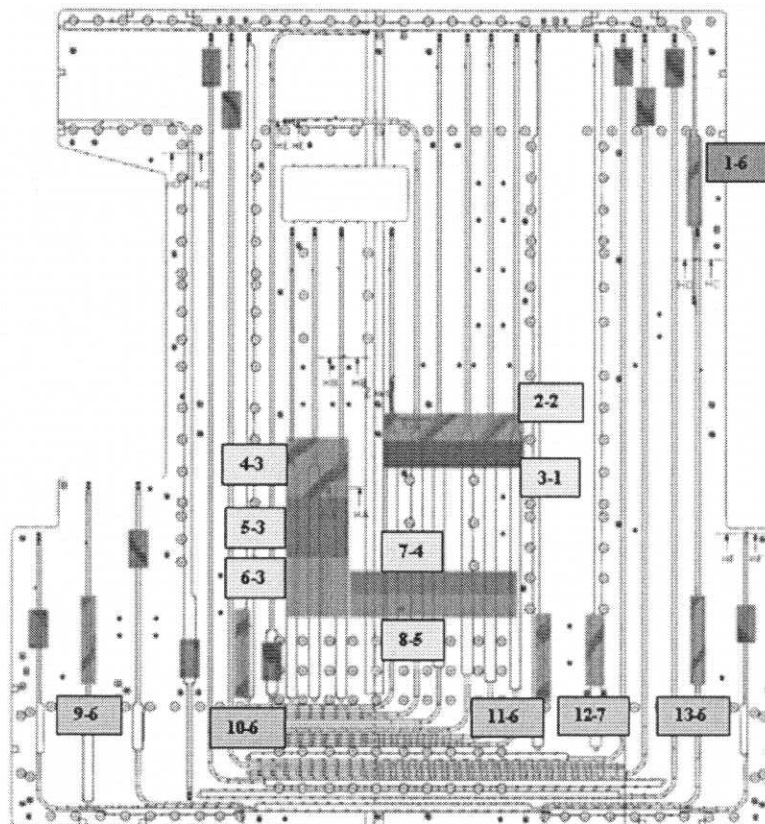
The following picture , taken from 22-AMS.000.00.63, shows the heater part ballooning for the heater part number identification.



The following picture shows (in yellow) the patches that present unusual defects:



The following picture shows the heater numbering used to univocally identify the heater patches. The first number serves as sequential numbering for heater and the second number corresponds to the heater part number ballooned in 22-AMS.000.00.63



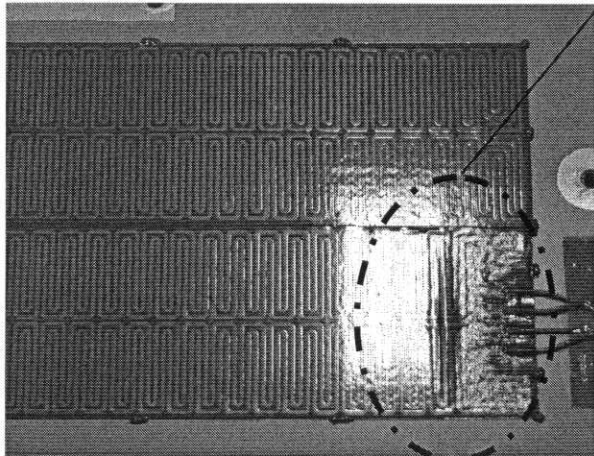
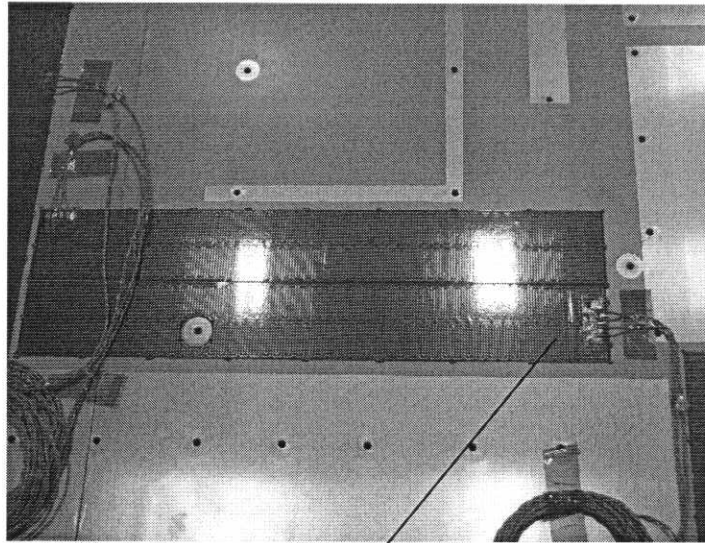
The heaters that present unusual defects are listed in the following table together with the defect type and picture reference if any.

Heater number	Picture Available	Defect
#8-5	✓	Bubble
#7-4	✓	Wrinkle
#12-7	✓	Wrinkle
#1-6	✓	Half moon

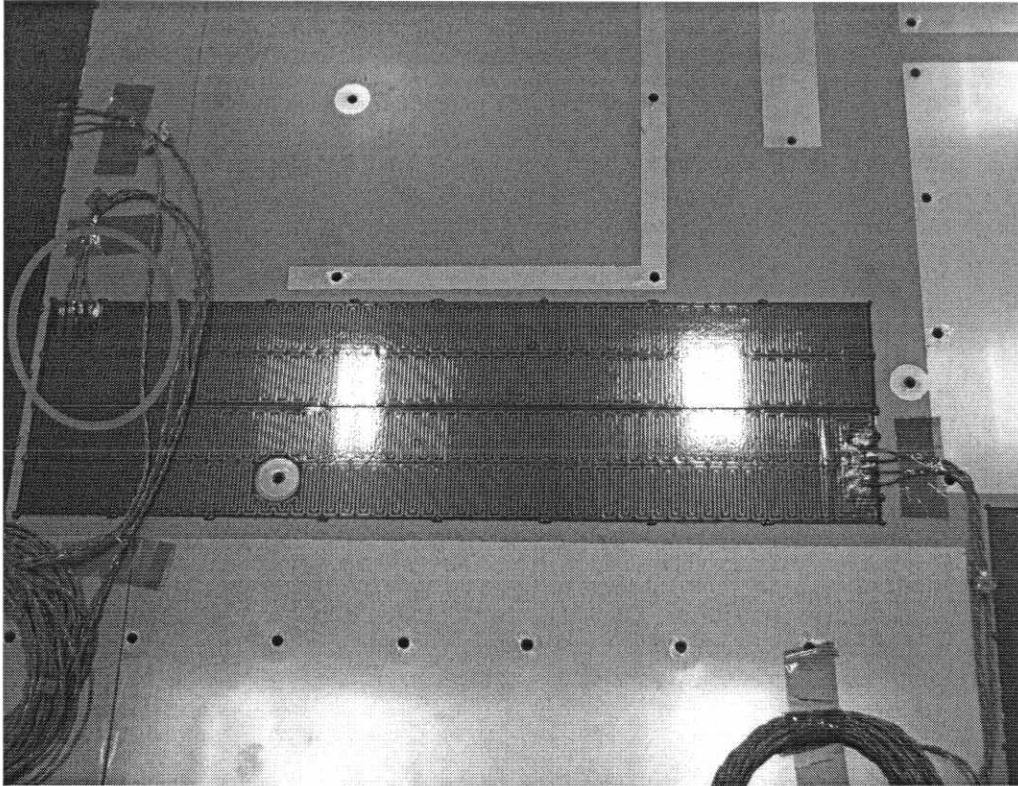
The following picture sequence shows the de-bonding type associated with the heater patch.

Heater#8-5

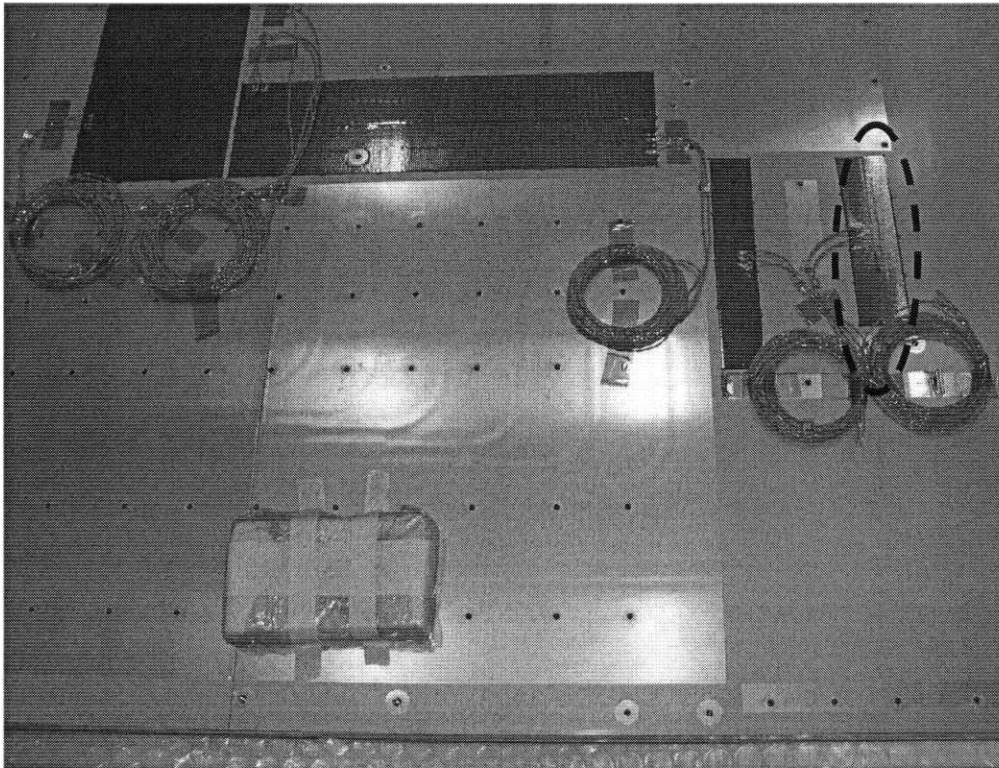
Defect type : Bubble

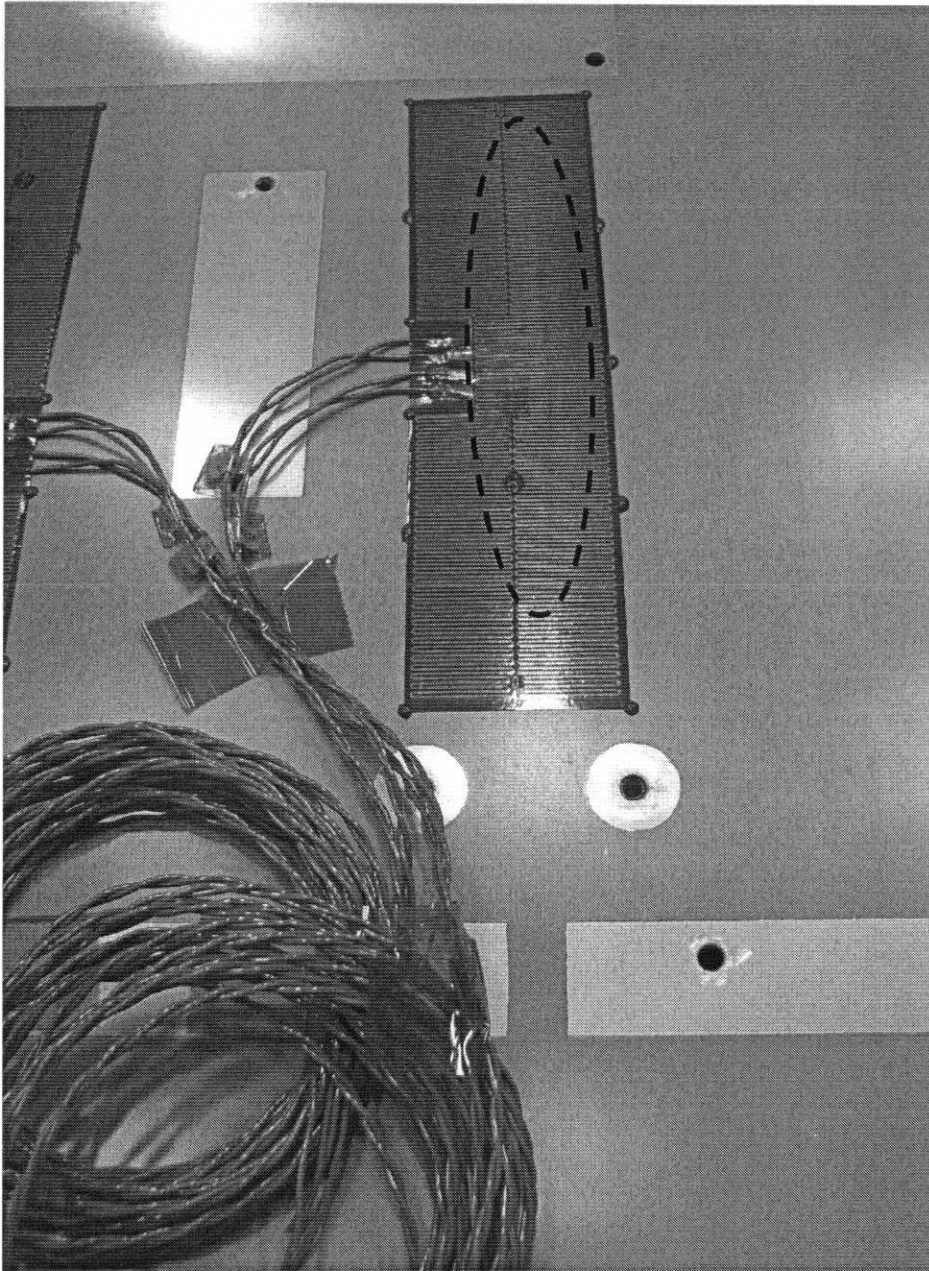


Heater#7-4
Defect type : wrinkle



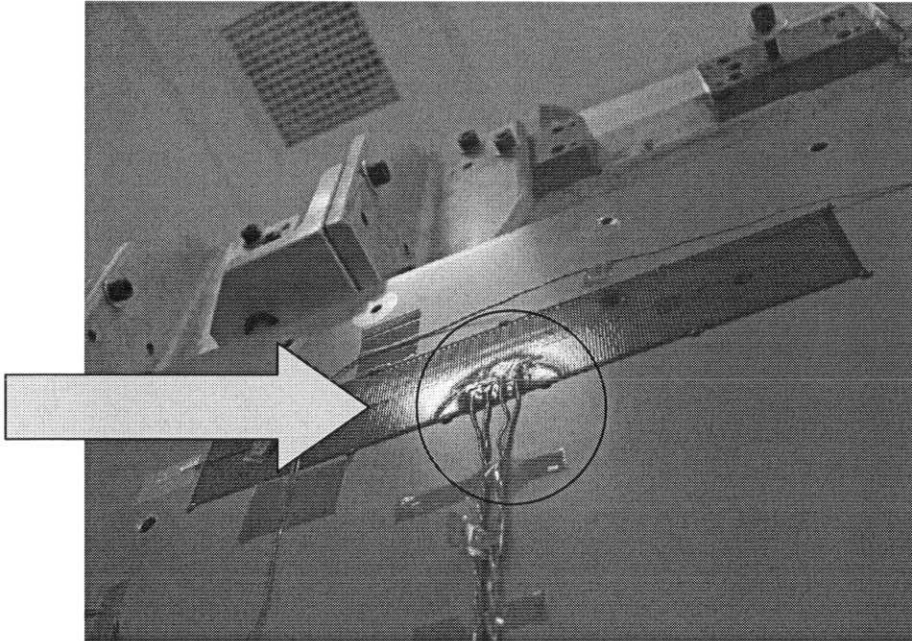
Heater#12-7
Defect type : wrinkle





Heater#1-6

Defect type : half-moon de-bonding at the lead exit level.



Amex 2 to NCR-TCS-CGS-C-001

Luigi Cremonesi**Da:** Marchetti Ernesto [ernesto.marchetti@asi.it]**Inviato:** lunedì 19 gennaio 2009 13.41**A:** Joseph Burger; mmolina@cgspace.it; molivier@cgspace.it; cvettore@cgspace.it; lcremonesi@cgspace.it; John.Heilig@escg.jacobs.com; craig.clark@escg.jacobs.com**Cc:** r.battiston@tiscali.it; adellacqua@cgspace.it; jvanes@nlr.nl; Russo Enrico**Oggetto:** I: please help me0

On January 16, 2009, was held the Non Conformance Review Board (NRB), related to the below mentioned NCR. The following persons took part to this teleconference :

- Joseph Burger CERN
- E. Marchetti ASI
- M. Molina CGS
- M. Olivier CGS
- C. Vettore CGS
- L. Cremonesi CGS;
- John Heilig
- Craig Clark

The following Recovery Actions have been agreed upon :

- 1) NCR-TCS-CGS-C-001 (Mj) "WAKE RADIATOR Heaters de-bonding"
DISPOSITION:

- a) Cover all the Heaters with Chofoil (PN: CCJ-36-201-xxxx);
 - b) Heaters that are possibly directly exposed to sunlight shall be covered also with Kapton tape on top of the aluminum tape;
- CGS shall provide guidelines for aluminum and Kapton tape application;

The recovery action shall be performed by AMS collaboration and the radiators shall be ready for final inspection to ASI [3] months before the System Enviromental Test

- 2) NCR-TCS-CGS-C-002 (Mi) "TRACKER RADIATOR Surface Treatment"
DISPOSITION:

- a) AMS shall ask AIDC to provide CoCs of the surface treatment.

- 3) NCR-TCS-CGS-C-003 (Mj) "WAKE RADIATOR Sharp Edge"
DISPOSITION:

- a) Apply a protective cuff on top of the 2 corners. CGS to provide a concept sketch;
- b) AMS shall investigate with NASA if there is also need for protection on the radiator edges.

- 4) NCR-TCS-CGS-C-004 (Mj) "MECHANICAL PARTS"
DISPOSITION

- a) AMS shall remove the excess glue with dedicated tools;
- b) There is no need to clean the helicoils, AMS shall install the missing ones;
- c) AMS shall remove the paint according to the manufacturer's (MAP) procedure and apply Alodine by brush.

- 5) NCR-TCS-CGS-C-005 (Mi) "RADIATORS ADPs"
DISPOSITION:

- a) AMS has provided the Missing documents on FTP.

- 6) **NCR-TCS-CGS-C-006 (Mj) "RAM RADIATOR Heaters de-bonding"**
DISPOSITION:

- a) Same as NCR-TCS-CGS-C-001

- 7) **NCR-TCS-CGS-C-007** "(Mj)TRACKER RADIATORs Heaters de-bonding"
DISPOSITION:
a) Same as NCR-TCS-CGS-C-001

Best Regards

ERNESTO MARCHETTI
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CELL.: +39.3474562568
ERNESTO.MARCHETTI@ASI.IT

N° 292		RICEVUTO IL	
		27 APR. 2009	
L.Z.	Commissa	(2011i)	
L.M.	Offerta		
	Aktro		
R.A.	Data copia a:	VEDI ELENCO.	

pag. 1 di 1

Spett.
CGS - Carlo Gavazzi Space
Via Gallarate 150
20151 Milano (Italia)

Att.ne: CGS, • M. Olivier, • L. Cremonesi,
 • C. Vettore, • P. Lorenzi

CC: ASI Ing. Enrico Russo, E. Marchetti

Perugia 20/04/2009

Oggetto: Spedizione MAIN RADIATORS FM di AMS-02 presso la cleanroom CGS per attività di recovery e preparazione all' ispezione di presa in carico da parte di ASI\CGS.

Carissimi,

lo stato dell'integrazione di AMS determina una ridottissima disponibilità di spazio presso la cleanroom del CERN e un forte impegno contingente dei tecnici di AMS per le attività di test del Magnete, impedendo l'esecuzione tempestiva delle attività di recovery (evidenziate in occasione dell'ispezione da parte di ASI dei radiatori presso la Cleanroom del CERN) necessarie per la nuova ispezione e presa in carico dei radiatori da parte di ASI\CGS per procedere con le attività del Contratto ASI I/008/08/0.

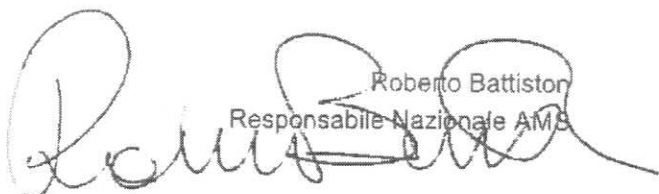
In base agli accordi in corso fra l'Ing. Olivier e Mr. Joseph Burger, apprezziamo e accettiamo quindi la proposta di CGS di utilizzare la propria cleanroom di Tortona, per anticipare le attività di recovery menzionate.

Spediremo dunque i RADIATORI MAIN RAM E WAKE e il materiale accessorio necessario per le attività di recovery presso la cleanroom CGS di Tortona quanto prima.

La Collaborazione AMS si farà carico degli oneri di trasporto e coperture assicurative relative al trasporto dei radiatori da e per il CERN.

Vi chiediamo inoltre di informarci sulla disponibilità di tecnici CGS per supportarci nelle prossime settimane nell'esecuzione delle attività di recovery menzionate, comunque sotto il controllo e la responsabilità della Collaborazione AMS consentendoci di non distrarre in questo momento particolarmente critico personale di AMS dalle attività di test del Magnete.


Cordiali Saluti.


 Roberto Battiston
 Responsabile Nazionale AMS



ID	ARGOMENTI DISCUSSI - DESCRIPTION OF DISCUSSION	AZIONE A CURA ACTION BY ¹⁾
1.	<p>AMS02 HEATERS INVESTIGATION STATUS: After detection of some bubbles on the main and tracker radiator panels heaters during AFE (ASI Agenvy Furnished Equipments) inspection at CERN (see NCR-TCS-CGS-C-001, 006 and 007), following the AMS Collaboration request at TIM october 2008, a joint investigation has been carried out by CGS and AMS to evaluate if the same issue is applicable to the other foil heaters applied on the AMS02 hardware. Status and conclusions of this investigation are summarized hereafter:</p>	
2.	<p>MAIN AND TRACKER RADIATORS HEATERS: A recovery action for the Main and Tracker radiator heaters has been proposed by CGS and accepted by the AMS Collaboration: all the heaters shall be covered with Aluminum tape to spread the heat away from the bubbles, avoiding the potential expanding of the bubbles and subsequent heater debonding. The proposed recovery action has been tested by CGS and it is applicable if the bubbles are less than 15mm diameter size. This requirement is met for all the Main and Tracker Radiator identified heaters. It has been also agreed to not further cover the Aluminum tape with Kapton , being the thermal effect of leaving the aluminum Chofoil exposed minor.</p> <p>The following chofoil application guidelines have been prepared by CGS and accepted by the AMS Collaboration :</p> <ol style="list-style-type: none"> 1- Check bubble size and if the diameter is less 15mm proceed with the chofoil application 2- Remove glue drops all around the heater patch 3- Clean the heater surface with IPA 4- Cut stripes of chofoil tape (CCJ-36-201-0100) and apply the stripes over the heater extending the tape out off the heater edge nearly 10mm. 5- Make the tape stripes overlapping each other by 5mm 	<p>RICEVUTO 09 APR 20 (2011)</p>

Mod. N° MOM-08/02

VEDI
ELENCO

 CARLO GAVAZZI SPACE SpA		RELAZIONE DI RIUNIONE / VISITA MINUTES OF MEETING / VISIT		N° AMSTCS-MI-CGS-034		
				FOGLIO SHEET	2 DI OF	3 ANNEX —
DATA – DATE 26/02/2009		LOCALITA' – LOCATION TELECON CERN-CGS		COMMESSA – JOB 2011 I, AMS TCS		RIF. – REF.

ID	ARGOMENTI DISCUSSI – DESCRIPTION OF DISCUSSION	AZIONE A CURA ¹⁾ ACTION BY ¹⁾
	6- Let the tape perfectly adhere the heater/overlapped tape with a pressure of a teflon tool 7- Adjust the chofoil all around the lead exit avoiding to cover the cables 8- Secure the chofoil tape all around the heater with drops of glue (EC2216 B/A Gray) AMS to issue the application procedure (ATS) format based on the agreed guidelines. AMS to proceed with Cho foil application for TRACKER RADIATORS. AMS to proceed with MAIN RADIATORS once heaters power drain issue shall be addressed.	AI1-AMS-TBD AI2-AMS-TBD
3.	TTCS CONDENSER HEATERS: TTCS condenser Heaters have been cycled in air by TTCS team according to a TTCS prepared procedure, approved by AMS Collaboration and NASA/JS. Inspection has been performed and no air bubbles have been identified. Inspection report shall be distributed on 05/03/09 On this ground, no recovery action has been foreseen for these heaters.	AI3-TTCS TEAM- 05/03/09
4.	JPD/J/J CRATE HEATERS : Heaters have been heated up to 50°C only once (no cycling has been performed). Inspection by AMS personnel after activation (no pictures available) has not shown any bubble. CGS advises to cycle the heaters and perform inspection before hand and after testing, considering these heaters are not yet cabled to radiator thermostats and they can be cycled. AMS claims that it is complex to activate, inspect and (in case it is needed) reach all the heaters for chofoil application at this time of the Integration flow with major impacts on schedule and risk of damage to the Crates FM HW disassembling it, introducing a higher risk. Further some of these heaters (J and JT) are very narrow and have had a minimum risk of entrapping air during installation. AMS Collaboration decision is therefore to use the heaters as they are.	
5.	EHV/RHV HEATERS. Acceptance TV tests of ECAL and RICH High Voltage Bricks have been carried out. 12 HVBs have been tested : 7 of them are ECAL type and 5 RICH type. All the HVBs are equipped with heaters. Test data provided to CGS show that heaters have been activated only in 4 HVBs. All the other heaters have been vacuum cycled but not activated, and no inspection has been done at the end of testing being all the heaters mounted inside the boxes. The test sensors have shown good results for the activated heaters. No inspection is advised for these heaters. CGS advises to cycle the remaining heaters and inspect them after testing. AMS claims that it is complex to activate, inspect and (in case it is needed) reach all the heaters for chofoil application at this time of the integration flow with major impacts on schedule and risk of damage to the HV FM H/W disassembling it, introducing a higher risk than to have a bubble on these heaters. Further these heaters are quite narrow and have had a minimum risk of entrapping air during installation, and Inspection of a spare installed heater shows no bubbles. AMS Collaboration decision is therefore to use the heaters as they are.	
6.	ECAL, TOF and RICH HEATERS: <ul style="list-style-type: none"> ECAL radiators have heaters mounted on the backside that have been activated during ECAL thermal vacuum test. CGS advises to evaluate the heaters test results to identify possible criticalities not detected during test. TOF has heaters mounted inside the detector carbon fiber box that is now sealed. These heaters have been activated during TOF thermal vacuum test. CGS advises to evaluate the heaters test results to identify possible criticalities not detected during test. RICH heaters were never vacuum tested. Pictures – taken just before mirror was mounted - show no bubbles. 	

 CARLO GAVAZZI SPACE SpA		RELAZIONE DI RIUNIONE / VISITA MINUTES OF MEETING / VISIT		N° AMSTCS-MI-CGS-034	
		FOGLIO SHEET		3	DI OF
				3	ANNEX 
DATA - DATE 26/02/2009		LOCALITA' - LOCATION TELECON CERN-CGS		COMMESSA - JOB 2011 I, AMS TCS	
				RIF. - REF.	

ID	ARGOMENTI DISCUSSI - DESCRIPTION OF DISCUSSION	AZIONE A CURA ¹⁾ ACTION BY ¹⁾
	<p>CGS advises to cycle the heaters (e.g. cutting accessible heaters cables and supply them by-passing thermostats) and perform inspection to verify presence of bubbles.</p> <p>Independently from further assessments based on review of test data to assess possible heaters malfunction, AMS, for these heaters group, claims that it is too complex to activate, inspect and (in case it is needed) reach all the heaters for chofoil application at this time of the integration flow with major impacts on schedule and risk of damage to the FM H/W disassembling it, introducing a higher risk than to have a bubble on these heaters.</p> <p>AMS Collaboration decision is therefore to use the heaters as they are.</p>	
7.	<p>E-CRATE HEATERS:</p> <p>Acceptance TV tests of E-CRATES have been carried out. 2 E-CRATES have been tested. Both the E-CRATES are equipped with heaters.</p> <p>Test data provided to CGS show that heaters have been activated only in one E-CRATE. The heaters of the second E-CRATE have been vacuum cycled but not activated, and no inspection has been done at the end of testing.</p> <p>The test sensors of the E-CRATE with heaters activated have shown good results and no inspection is advised for these heaters.</p> <p>CGS advises to cycle the second E-CRATE heaters and inspect them after testing, considering the thermostats controlling these heaters are outside the crate and can be easily by-passed.</p> <p>AMS claims that it is complex to activate, inspect and (in case it is needed) reach all the heaters for chofoil application at this time of the integration flow with major impacts on schedule and risk of damage to the HV FM H/W disassembling it, introducing a higher risk than to have a bubble on these heaters.</p> <p>AMS Collaboration final decision is therefore to use the heaters as they are.</p>	
8.	<p>CONCLUSIONS AND COMMENTS:</p> <p>CGS states that the recommended tests and inspections are the only way to control the risk of having a heater malfunction due to possible entrapped air bubbles.</p> <p>NASA/JS states that the probability to have an on-orbit failure is remote.</p> <p>AMS Collaboration remarks that in any case the AMS-02 shall be vacuum tested at ESTEC and possible criticalities shall be identified at that time.</p> <p>Therefore AMS Collaboration final decision is that all the AMS-02 heaters shall be used as they are during the TVTB test of AMS without any further recovery activity except for the main and tracker radiators where all the heaters shall be covered with chofoil.</p>	
9.	End of MoM	

1/2

Luigi Cremonesi

Da: Massimiliano Olivier [molivier@cgspace.it]
Inviato: mercoledì 20 maggio 2009 19.54
A: 'Joseph Burger'; 'Clark, Craig S'; 'Roberto Battiston'
Cc: cvettore@cgspace.it; mmolina@cgspace.it; adellacqua@cgspace.it; plorezi@cgspace.it; lcremonesi@cgspace.it
Oggetto: R: MAIN RADIATORS RECOVERY: HEATERS PATCHING PROPOSAL and request for ATP
Allegati: MAIN AND TRAKER RADS HEATERS PATCHING TEST-V1.PPT

Da: Massimiliano Olivier [mailto:molivier@cgspace.it]
Inviato: mercoledì 20 maggio 2009 18.49
A: 'Joseph Burger'; 'Clark, Craig S'; 'Roberto Battiston'
Cc: 'cvettore@cgspace.it'; 'mmolina@cgspace.it'; 'adellacqua@cgspace.it'; 'plorezi@cgspace.it'; 'lcremonesi@cgspace.it'
Oggetto: MAIN RADIATORS RECOVERY: HEATERS PATCHING PROPOSAL and request for ATP

Dear All,

in annex a picture of a heater patching test with chofoil that covers also the glue spots.

This approach has been tested because it is time saving but the final result is NOT good as we expected and risk of air bubbles is detected.

We therefore advise not to use this solution.

After review of the panels the glue removal is also considered risky for possible damage of the heaters considering the extension of the panel do not allow easy access with removing tools, the high number of spots, and local heat up of the skin with the needed heater gun

We therefore advise to use the tape removing a small portion of it all around the glue spots, shaping the tape before application to the heater as showed on the last annexed slide.

This approach is time consuming but safe.

We shall send you a picture of the first FM heater done according to the proposal for check before to apply the process on all the other FM items.

Please authorize to proceed with the application of the chofoil as proposed.

Cordiali Saluti\Best Regards

Massimiliano Olivier
Project Manager

Space Infrastructure and Science Dept.

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26/05/2009

TIME CONSUMING BUT NO AIR BUBBLES RISK

PREFERRED SOLUTION

(TAPE SHAPED BEFORE INSTALLATION ON HEATER)

